WHAT IS CLAIMED IS:

1. An optical transmitter comprising:

a modulated source for generating a modulated optical signal; and

a vertical lasing semiconductor optical amplifier (VLSOA) coupled to the modulated source for amplifying the modulated optical signal, the VLSOA comprising:

a semiconductor active region;

an amplifying path traversing the semiconductor active region; and

a laser cavity including the semiconductor active region, wherein the laser cavity is oriented vertically with respect to the amplifying path and pumping the laser cavity above a lasing threshold clamps a gain along the amplifying path to a substantially constant value.

2. The optical transmitter of claim 1 wherein the modulated source and the VLSOA are implemented as discrete devices.

3. The optical transmitter of claim 2 further comprising:

an optical fiber coupling the modulated source to the VLSOA.

4. The optical transmitter of claim 2 further comprising:

free space optics coupling the modulated source to the VLSOA.

5. The optical transmitter of claim 1 wherein the modulated source comprises:

a laser source; and

a modulator coupled to the laser source.

6. The optical transmitter of claim 5 wherein the laser source and the modulator together include an electro-absorption modulated laser (EML).

7. The optical transmitter of claim 5 wherein:

the laser source and the modulator together include a wavelength-tunable laser integrated with an electro-absorption modulator; and

the VLSOA is implemented as a discrete device.

8. The optical transmitter of claim 5 wherein:

the laser source includes a wavelength-tunable laser;

the modulator includes an electro-absorption modulator; and

the wavelength-tunable laser, the electro-absorption modulator and the VLSOA are integrated on a common substrate.

9. The optical transmitter of claim 5 further comprising:

a semiconductor optical amplifier coupled between the laser source and the modulator.

10. The optical transmitter of claim 5 wherein the laser source is selected from a group consisting of a DBR laser and a DFB laser.

11. The optical transmitter of claim 5 wherein the modulator includes an electro-absorption modulator.

12. The optical transmitter of claim 5 wherein the modulator includes a lithium niobate modulator.

13. The optical transmitter of claim 5 wherein:

the laser source comprises an active region;

the modulator comprises an active region;

the laser source, the modulator and the VLSOA are integrated on a common substrate;

the active region of the laser source transitions into the active region of the modulator; and

the active region of the modulator transitions into the semiconductor active region of the VLSOA.

14. The optical transmitter of claim 5 wherein:

the laser source comprises an active region;

the modulator comprises an active region; and

the laser source, the modulator and the VLSOA are integrated on a common substrate;

the semiconductor active region of the VLSOA and the active regions of the laser source and the modulator are based on a common structure which has been altered so that the semiconductor active region of the modulator has a different transition energy than the active region of the laser source and the active region of the VLSOA.

15. The optical transmitter of claim 5 wherein the laser source, the modulator and the VLSOA are integrated on an InP substrate.

16. The optical transmitter of claim 1 further comprising:

at least one additional modulated source, wherein each modulated source generates a modulated optical signal at a different wavelength; and

an optical coupler coupling the modulated sources to the VLSOA.

17. The optical transmitter of claim 16 wherein each modulated source comprises:

a laser source integrated with a modulator.

18. The optical transmitter of claim 16 wherein the modulated sources, the optical coupler and the VLSOA are integrated onto a common substrate.

19. The optical transmitter of claim 16 wherein the optical coupler comprises a wavelength division multiplexer.

20. The optical transmitter of claim 16 further comprising:

a plurality of optical amplifiers, at least one optical amplifier coupled between each modulated source and the optical coupler for amplifying the modulated optical signal generated by the modulated source.

21. The optical transmitter of claim 1 further comprising:

at least one additional modulated source; and

an optical coupler coupling the modulated sources to the VLSOA.

22. The optical transmitter of claim 1 wherein the modulated source comprises an internally modulated laser source.

23. The optical transmitter of claim 22 wherein the internally modulated laser source is integrated with the VLSOA on a common substrate.

24. The optical transmitter of claim 22 wherein the internally modulated laser source includes a vertical cavity laser.

25. The optical transmitter of claim 1 wherein the modulated optical signal lies in a wavelength region located between 1.3 micron and 1.7 micron.

26. The optical transmitter of claim 1 wherein the modulated optical signal includes at least two channels located at different wavelengths.

27. The optical transmitter of claim 1 wherein the modulated optical signal is modulated at a data rate of at least 1 Gbps.

28. The optical transmitter of claim 1 wherein the substantially constant value is adjustable.

29. An optical modulator comprising:

an external modulator; and

a vertical lasing semiconductor optical amplifier (VLSOA) coupled to the external modulator, the VLSOA comprising:

a semiconductor active region;

an amplifying path traversing the semiconductor active region; and

a laser cavity including the semiconductor active region, wherein the laser cavity is oriented vertically with respect to the amplifying path and pumping the laser cavity above a lasing threshold clamps a gain along the amplifying path to a substantially constant value.

30. The optical modulator of claim 29 wherein the external modulator and the VLSOA are integrated onto a common substrate.

31. The optical modulator of claim 30 wherein the external modulator includes an electro-absorption modulator.

32. The optical modulator of claim 30 wherein:

the external modulator comprises an active region; and

the active region of the external modulator transitions into the semiconductor active region of the VLSOA.

33. The optical modulator of claim 30 wherein:

the external modulator comprises an active region; and

the semiconductor active region of the VLSOA and the active region of the external modulator are based on a common structure which has been altered so that the semiconductor active region of the VLSOA has a different transition energy than the active region of the external modulator.

34. An optical source comprising:

a laser source; and

a vertical lasing semiconductor optical amplifier (VLSOA) coupled to the laser source, the VLSOA comprising:

a semiconductor active region;

an amplifying path traversing the semiconductor active region; and

a laser cavity including the semiconductor active region, wherein the laser cavity is oriented vertically with respect to the amplifying path and pumping the laser cavity above a lasing threshold clamps a gain along the amplifying path to a substantially constant value.

35. The optical source of claim 34 wherein the laser source and the VLSOA are integrated onto a common substrate.

36. The optical source of claim 35 wherein the laser source is selected from a group consisting of a DBR laser and a DFB laser.

37. The optical source of claim 35 wherein:
the laser source comprises an active region; and
the active region of the laser source transitions into the active region of the VLSOA.

38. The optical source of claim 35 wherein:
the laser source comprises an active region; and
the semiconductor active region of the VLSOA and the active region of the laser source are based on a common structure.

39. The optical source of claim 35 wherein the common substrate is an InP substrate.

40. The optical source of claim 34 wherein the laser source includes a multi-wavelength source.

41. The optical source of claim 34 wherein the laser source includes a tunable-wavelength laser source.

42. A high power, high speed optical transmitter comprising:
a laser source for generating an optical carrier;

a modulator coupled to the laser source for modulating data onto the optical carrier at a data rate of at least 1 Gbps; and

a linear, semiconductor optical amplifier coupled to the modulator capable of amplifying the modulated optical carrier to a power of at least 1 mW.

43. The optical transmitter of claim 42 wherein the linear, semiconductor optical amplifier comprises a VLSOA.

44. The optical transmitter of claim 42 wherein the laser source and the modulator together include an electro-absorption modulated laser (EML).

45. The optical transmitter of claim 42 wherein the laser source, the modulator and the semiconductor optical amplifier are integrated on a common substrate.